

45.(amended) The fuel composition of claim 40 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 or less.

46.(amended) The fuel composition of claim 45 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.1:1 or less.

47.(amended) The fuel composition of claim 45 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 to 1:1.

54.(amended) The fuel composition of claim 40 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 18 carbon atoms.

55.(amended) The fuel composition of claim 54 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 6 carbon atoms.

56.(amended) The fuel composition of claim 55 wherein the secondary monoamine is dibutyl amine.

REMARKS

Rejections Under 35 U.S.C. 102

It is respectfully requested that the Examiner withdraw the rejection of claims 1-11, 13, 17-33, 35, 39-55, 57-61, and 63-64 under 35 U.S.C. 102(b). The Examiner has not rejected claim 12. Malfer (US 5,697,988) does not anticipate the claims of the present invention, as it

does not disclose the novelty of the present invention. While Malfer ('988) teaches a detergent composition for reducing engine deposits that utilizes a Mannich reaction products, the '988 patent neither discloses nor anticipates the composition of the present invention. However, to distinguish a critical element of the present invention, claims 1, 6, 7, 8, 10, 11, 12, 17, 22, 23, 24, 34, 40, 45, 46, 47, 54, 55, and 56 of the application have been amended herein to specify that the amine constituent is a monoamine. The prior art's reliance on polyamine constituents in the Mannich reaction did not predict the success achieved in the present invention when restricting the amine constituent to contain only one nitrogen atom. This is not new matter and is supported in the specification at for example, page 7 (lines 4-7 and 14-16).

In the '988 patent, Malfer discloses and claims a variety of Mannich reaction products, yielding a formulation useful for controlling engine deposits and optimizing octane requirements. However, in the specification of the '988 patent it is noted that not *all* Mannich reaction products are effective detergents. The components in the '988 patent incorporated into the Mannich reaction are: (a) high molecular weight alkyl-substituted hydroxyaromatic compounds or other phenolic compounds, (b) amine reactants, such as alkylene polyamines, and (c) aldehydes, such as formaldehyde. While the present invention shares similarity in that it also relies on a Mannich reaction, the present invention demands specific materials to obtain a specific product. In addition, an important feature of the '988 patent is the preferred use of polyol in its formulation, in contrast to previous teachings using mineral oil.

The present application is distinguishable from the '988 patent in at least two respects. First, the present invention as currently claimed utilizes a secondary amine having only one nitrogen atom capable of entering into the Mannich reaction. Second, the present invention requires the hydroxyaromatic or phenolic compound to be sterically blocked in two positions on

the aromatic ring. By isolating two specific constituents entering the Mannich reaction, the present invention targets a product that was not disclosed in, and could not have been attained by, the teachings of the '988 patent.

The present invention targets a single product, and accomplishes its goal by restricting constituents to those having limited reactivity. The '988 patent does not predict the advantages of utilizing a secondary amine having only one nitrogen atom, nor does it promote blocking an additional position on the aromatic constituent during the Mannich reaction. In specifying the characteristics of the amine component, the present application provides for only amino group capable of entering into the Mannich condensation reaction—yielding a novel and much purer product. In permitting the use of diamines and polyamines, the '988 patent allows for transformations during the Mannich reaction that lead to multiple reaction products which creates undesirable waste accumulation and/or intake valve deposits. It is an unexpected and highly beneficial result of the present invention to dramatically reduce or eliminate unnecessary reaction by-products. It is a still further unexpected and highly beneficial result of the present invention to dramatically improve the detergency of the resulting Mannich reaction product.

Furthermore, the '988 patent provides as its preferred amine reactants those having 2 to 10 nitrogen atoms per molecule (column 4, line 21). While the '988 patent does allow the amine constituent to be a monoamine, its reaction products would still differ both structurally and functionally from those of the present invention.

In addition to its reliance on a secondary amine in the Mannich reaction, the present invention also specifies the incorporation of a di-substituted hydroxyaromatic component. The '988 patent discloses mono-substituted hydroxyaromatic or phenolic compounds, as well as those having additional substitutions. The preferred components disclosed therein are

polypropylphenol and polybutylphenol (column 3, lines 58-60), and the '988 patent's claims refer only to an "alkyl substituted phenol." As noted on page 2 (lines 18-20) of the present application, the compounds of the present invention demonstrate unexpectedly higher yields than those made from mono-substituted hydroxyaromatic compounds, or those made from primary amines. The '988 patent thus does not contemplate the specificity of the present application achieved through the blocking of an additional reactive site on the aromatic ring of the phenolic constituent to thereby control and direct the reaction site on the aromatic ring.

The unexpected success achieved by the method of claim 57 of the present invention is demonstrated in Table 1 (p. 19) of the present application. In Table 1, a detergent prepared with DMAPA (a diamine) is compared with monoamine detergent products, dibutylamine (DBA) and dimethylamine (DMA). A dramatic and unexpected decrease in the amount of intake valve deposits (IVD) was demonstrated by the monoamine compounds of the present inventions when applied at the same treat rates and with the same ratios of detergent to carrier. Specifically, Sample 2 using dibutylamine demonstrates an IVD of 27.6 mg, which is less than half of the amount of IVD generated in Sample 1 using DMAPA (56.95 mg). The data in Table 1 clearly show a dramatic improvement in IVD when using monoamine-derived Mannich constituents, a result that was neither expected nor predicted in the references cited by the Examiner.

While the present application and the '988 patent share some similar characteristics, the '988 patent does not disclose the composition of the present invention. The '988 patent does not teach the limitations of the claims of the present application, namely the strategic blocking of a position on the aromatic ring, in conjunction with the utilization of a secondary amine in the Mannich reaction. The '988 patent therefore cannot support a rejection under 35 U.S.C. 102. It

is respectfully requested that the Examiner withdraw the rejection of the claims under 35 U.S.C. 102 in favor of allowance of the present application as amended herewith.

Rejections Under 35 U.S.C. 103

The Examiner has rejected claims 1, 34, 56 and 62 (but not claim 12) under 35 U.S.C. 103(a).

It is respectfully requested that the Examiner withdraw the rejection of Claims 1, 34, 56, and 62 under 35 U.S.C. 103(a) as being unpatentable under Malfer (5,697,988), and also the further rejections of Claims 14-16 and 36-38 in view of Malfer (5,725,612). The scope and content of these patents is not commensurate with the disclosure of the present invention. It would not have been obvious to one skilled in the art to select the components of the present application, rather, the present invention achieves a principal reaction product with surprising detergency effectiveness and high yield that is not predicted in the cited references. However, as noted previously, the claims of the present application have been amended to specify that the secondary amine component must be a monoamine.

The present invention is directed to a compound having an aromatic ring with a blocked position that arises from a Mannich reaction with a secondary monoamine having two alkyl constituents. The process and product arising from this invention would not be obvious from the prior art cited by the Examiner. Instead, by limiting the reactivity of the amine constituent and the aromatic constituent, the present invention leads to a novel detergent that could not have been contemplated in view of these references.

The '612 patent is particularly distinguishable from the present invention in its exclusive reliance on diamines and polyamines as the constituent in the Mannich reaction. Neither the

claims nor the specification of the '612 patent introduce or render obvious the use of monoamines or the benefit derived from a monoamine. In support, the Examiner is directed to Table 1 of Applicants' specification, wherein it would not be obvious based on the use of a diamine (DMAPA) to achieve the surprising IVD results obtained from the monoamine (DBA or DMA).

The '988 patent is further distinguished from the present invention in that the teachings in that patent are directed toward a multitude of compounds and reagents with no prediction of the advantages of the present application. The singular product achieved in high yield in the present application is notable in its effectiveness, as demonstrated in Table 1. The constituents entering into the Mannich reaction may be selected from a vast array of the three main components, however, there is no indication in the '988 patent that it would be preferable to attain a single product by restricting the reactivity of the reaction agents. Thus, one skilled in the art could not have speculated that by restricting both the amine constituent to a monoamine and the aromatic constituent to one having a blocked position, a novel and more effective detergent compound would result. The progressive teachings of the references to employ diamines and polyamines would certainly move in the opposite direction from the current invention. Furthermore, the unexpected potency of the product of the present invention would not be predictable based on structural similarity among compounds. It is submitted that the present invention, as distinguished utilizing monoamine constituents, achieves surprising distinction from those prepared through the Mannich reaction using other constituents.

A third distinction from the '988 patent is its express requirement of a polyol compound in conjunction with the Mannich reaction products as the components for a fuel additive composition (column 5, lines 20-22). Previously, compositions had relied on mineral oil in

compiling fuel additive compositions. Thus, an element of novelty of the '988 patent resided in its incorporation of polyol compounds and Mannich reaction products, and that aspect clearly teaches one of ordinary skill in the art away from the present invention.

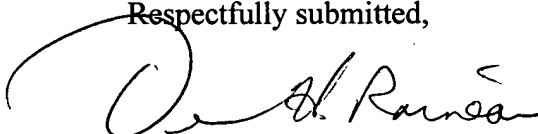
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As this response is timely filed, it is believed that no additional fee is due. However, in the event the undersigned is mistaken in his calculations, the Assistant Commissioner is authorized to debit the appropriate fee, or any other required fee, from the deposit account of the undersigned, No. 05-1372.

CONCLUSION

It is respectfully requested that the Examiner withdraw the rejection of the claims under 35 U.S.C. 102 and 35 U.S.C. 103 in favor of allowance of the present application as amended herewith.

Respectfully submitted,

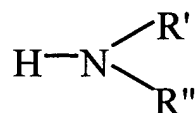


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APPENDIX**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

1.(amended) A Mannich reaction product obtained by reacting (i) at least one di-substituted hydroxyaromatic compound having on the ring both (a) an aliphatic hydrocarbyl substituent derived from a polyolefin having a number average molecular weight in the range of about 500 to about 3000, and (b) a C₁₋₄ alkyl; (ii) at least one secondary monoamine of the formula



wherein R' and R'' are independently alkyl groups having from 1 to 30 carbon atoms; and (iii) at least one aldehyde.

6.(amended) The Mannich product of claim 1 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 or less.

7.(amended) The Mannich product of claim 6 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.1:1 or less.

8.(amended) The Mannich product of claim 6 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 to 1:1.

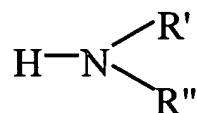
10.(amended) The Mannich product of claim 1 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 18 carbon atoms.

11.(amended) The Mannich product of claim 10 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 6 carbon atoms.

12.(amended) The Mannich product of claim 11 wherein the secondary monoamine is dibutyl amine.

17.(amended) A fuel additive composition comprising:

- a) a fuel-soluble Mannich detergent/dispersant obtained by reacting (i) at least one di-substituted hydroxyaromatic compound having on the ring both (a) an aliphatic hydrocarbyl substituent derived from a polyolefin having a number average molecular weight in the range of about 500 to about 3000, and (b) a C₁₋₄ alkyl; (ii) at least one secondary monoamine of the formula



wherein R' and R'' are independently alkyl groups having from 1 to 30 carbon atoms; and (iii) at least one aldehyde; and

- b) at least one liquid carrier for said Mannich detergent/dispersant in proportions such that for each part by weight of Mannich detergent/dispersant on an active ingredient basis there is in the range of about 0.3 to about 2.0 parts by weight of liquid carrier therefor.

22.(amended) The composition of claim 17 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 or less.

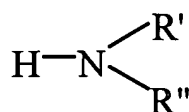
23.(amended) The composition of claim 22 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.1:1 or less.

24.(amended) The composition of claim 22 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 to 1:1.

34.(amended) The composition of claim 33 wherein the secondary monoamine is dibutyl amine.

40.(amended) A fuel composition for use in a spark-ignition internal combustion engine comprising a spark-ignition fuel into which has been blended:

- a) a fuel-soluble Mannich detergent/dispersant obtained by reacting (i) at least one di-substituted hydroxyaromatic compound having on the ring both (a) an aliphatic hydrocarbyl substituent derived from a polyolefin having a number average molecular weight in the range of about 500 to about 3000, and (b) a C₁₋₄ alkyl; (ii) at least one secondary monoamine of the formula



wherein R' and R'' are independently alkyl groups having from 1 to 30 carbon atoms; and (iii) at least one aldehyde; and

- b) at least one liquid carrier for said Mannich detergent/dispersant in proportions such that for each part by weight of Mannich detergent/dispersant on an active ingredient basis there is in the range of about 0.3 to about 2.0 parts by weight of liquid carrier therefor; wherein a) and b) are present in an amount at least sufficient to reduce or minimize the weight of intake valve deposits in a spark-ignition internal combustion engine operated on said fuel composition.

45.(amended) The fuel composition of claim 40 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 or less.

46.(amended) The fuel composition of claim 45 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.1:1 or less.

47.(amended) The fuel composition of claim 45 wherein the mole ratio of aldehyde (iii) to monoamine (ii) is 1.2:1 to 1:1.

54.(amended) The fuel composition of claim 40 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 18 carbon atoms.

55.(amended) The fuel composition of claim 54 wherein R' and R'' of the secondary monoamine are independently alkyl groups having from 1 to 6 carbon atoms.

56.(amended) The fuel composition of claim 55 wherein the secondary monoamine is dibutyl amine.